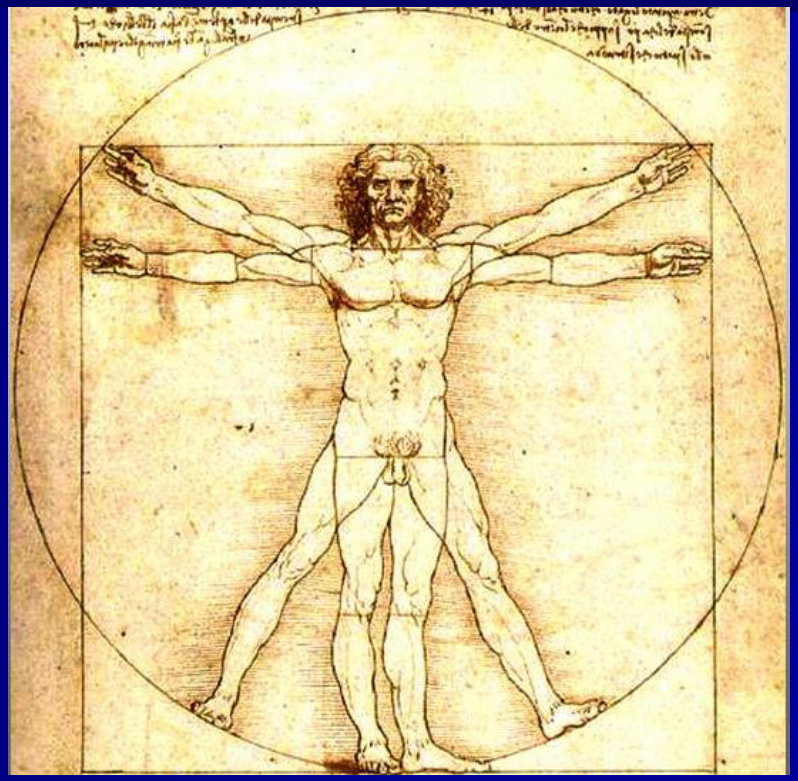
# Anatomy I:
# Human Anatomy

- Spring Semester 2012
- 5 Units
- Lab: Tues Thurs 7:30-10:20, Room 1810
- Lecture: Tues Thurs 11:00-12:15, Room 1814



Leonardo da Vinci

Developed by
John Gallagher, MS, DVM

LAS POSITAS COLLEGE

# John Gallagher, BS, MS, DVM

- Colorado State University
  - BS,  Animal Sciences, 1974
  - MS, Clinical Sciences, 1976
  - DVM, Veterinary Medicine, 1980

Body Worlds

# A Few Details:

Turn off your Cell Phone!  No texting, either.

Review the Safety Rules and microscope guidelines in the syllabus.

Don't bother to telephone me.  Email is much better!

Email:
jgallagher@laspositascollege.edu

My web site:
http://lpc1.clpccd.cc.ca.us/lpc/jgallagher/index.htm

Blackboard:
http://clpccd.blackboard.com/

# The Books:

- Marieb, Mallatt, Wilhelm, Human Anatomy, Pearson, Benjamin Cummings, 6th ed., 2011
- Marieb and Mitchell, Human Anatomy & Physiology Lab Manual, Cat Version, 10th edition, Update, Marieb, 2011

Optional:

- Kapit and Elson, The Anatomy Coloring Book

# First Assignment!

## Send me an email before Sunday, 11:00 PM, the first week of class

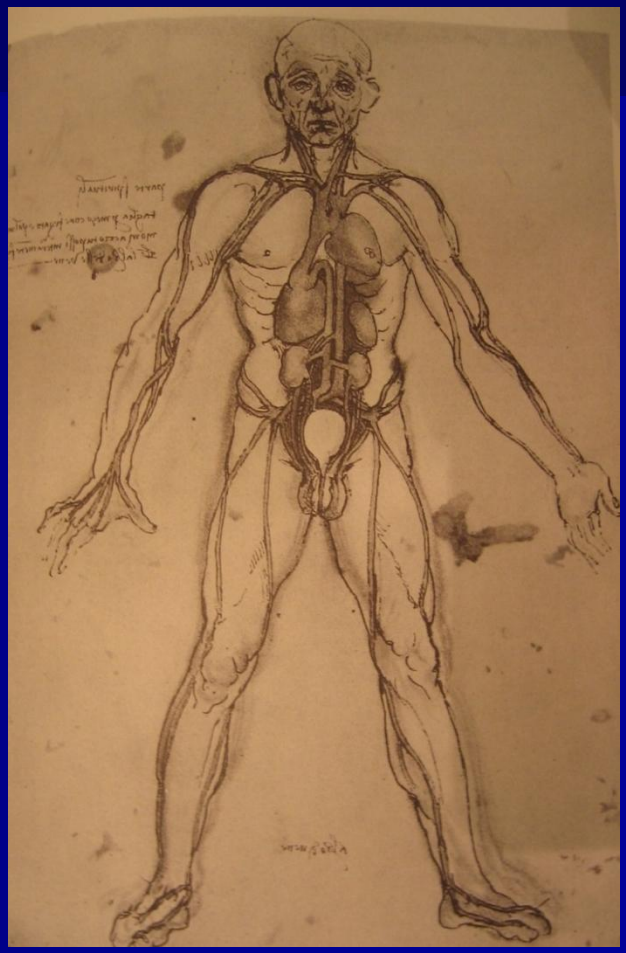
(3 points!)

- Always put Anatomy in the subject line.
  - Did you take Bio 31 at LPC?  Who was your instructor?
  - Why are you taking this class?
  - What is your college background?
  - Do you have a job?  Where?
  - What  special interests do you have?

ANATOMY CLASS
4631-5

# Anatomy =

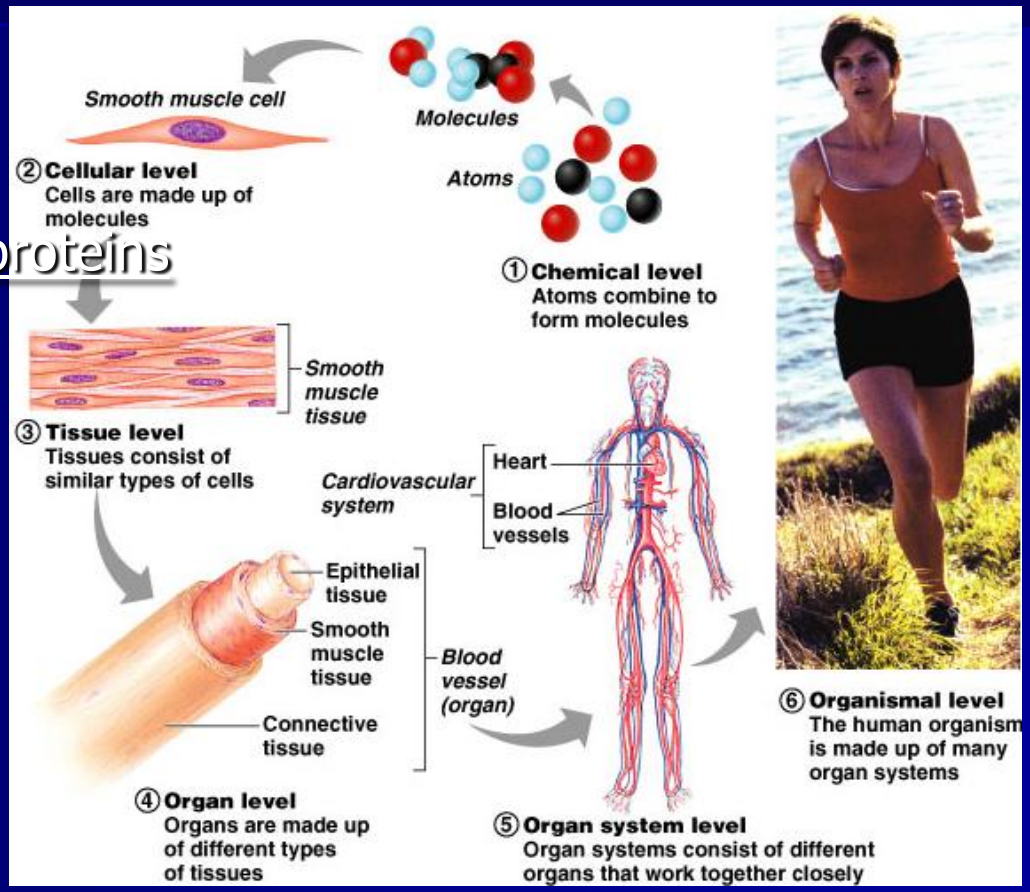
- The study of external and internal structures
- The physical relationships among body parts
- Temnein (Gr.) = cut



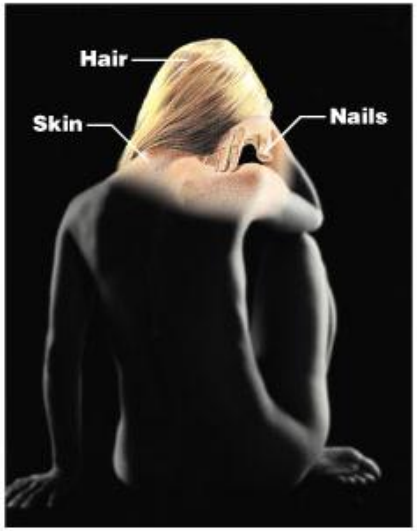
Leonardo da Vinci

# Organization

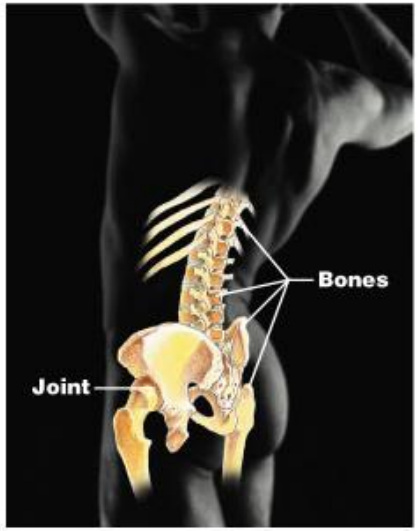
- Atoms
- Molecules and
- Macromolecules, such as proteins
- Organelles
- Cells
- Tissues
- Organs
- Organ Systems
- Organism



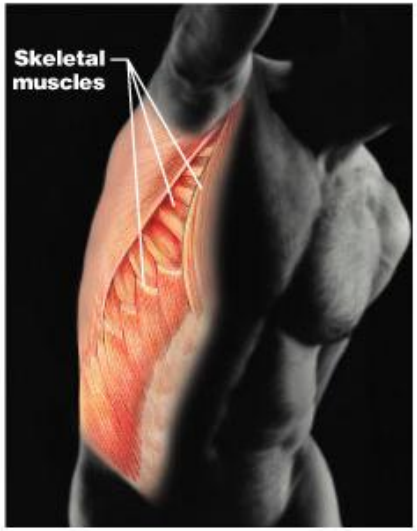
# The Systems



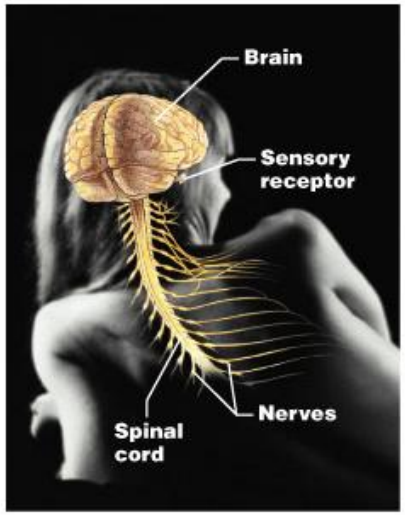

**(a) Integumentary System**
Forms the external body covering; protects deeper tissues from injury; synthesizes vitamin D; site of cutaneous (pain, pressure, etc.) receptors, and sweat and oil glands.



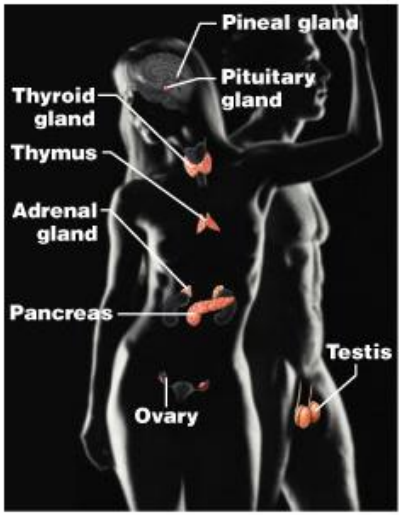

**(b) Skeletal System**
Protects and supports body organs; provides a framework the muscles use to cause movement; blood cells are form



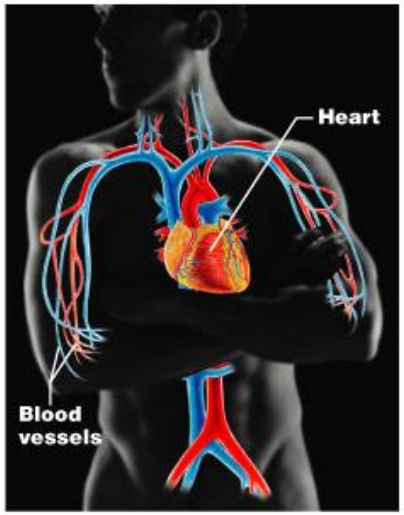

**(c) Muscular System**
Allows manipulation of the environment, locomotion, and facial expression; maintains



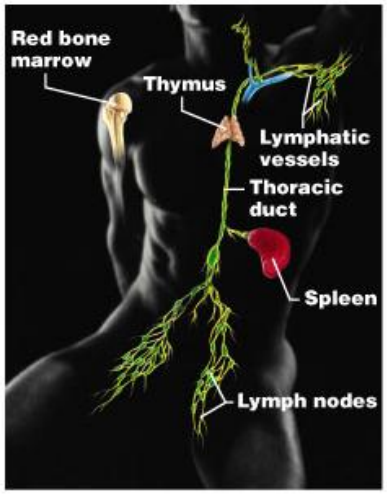

**(d) Nervous System**
Fast-acting control system of the body; responds to internal and external changes by activating appropriate muscles and glands.



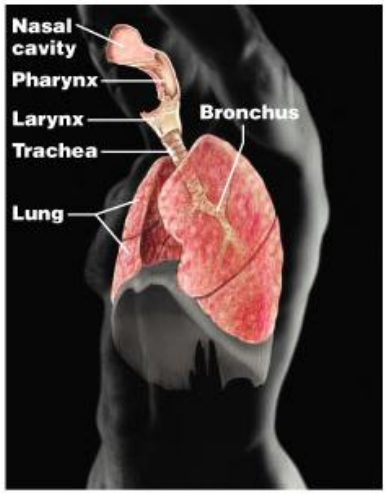

**(e) Endocrine System**
Glands secrete hormones that regulate processes such as growth, reproduction and nutrient use (metabolism) by body cells.



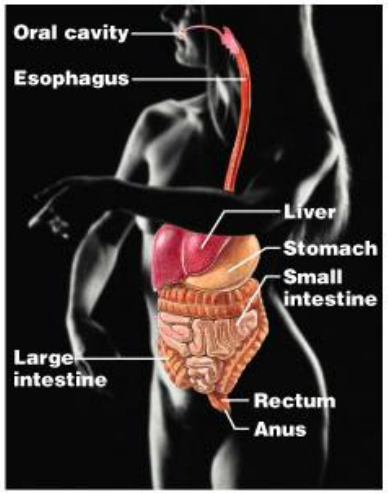

**(f) Cardiovascular System**
Blood vessels transport blood, which carries oxygen, carbon dioxide, nutrients, wastes, etc.; the heart pumps blood.



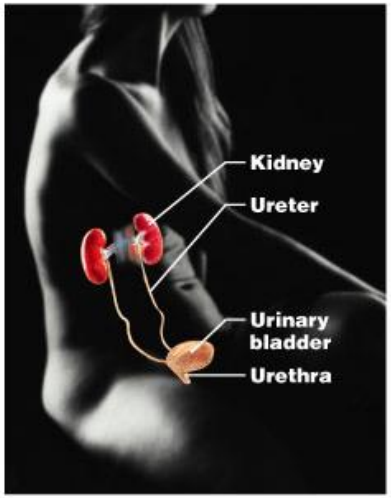

**(g) Lymphatic System/Immunity**
Picks up fluid leaked from blood vessels and returns it to blood; disposes of debris in the lymphatic stream; houses white blood cells (lymphocytes) involved in immunity. The immune response mounts the attack against foreign substances within the body.



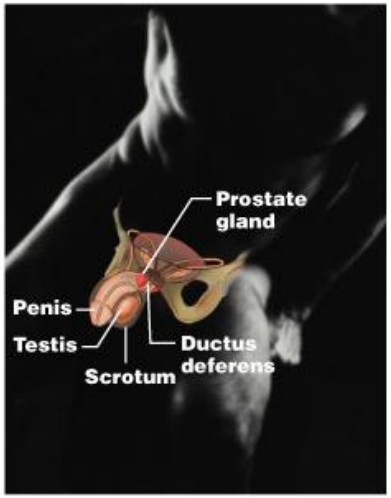

**(h) Respiratory System**
Keeps blood constantly supplied with oxygen and removes carbon dioxide; the gaseous exchanges occur through the walls of the air sacs of the lungs

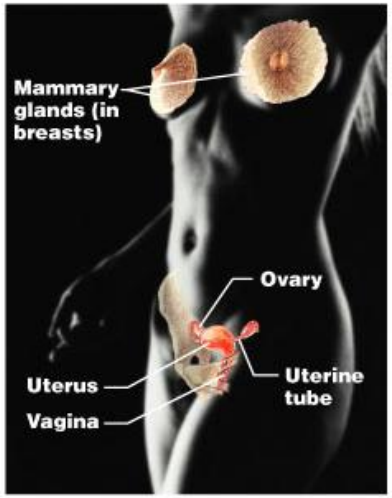



**(i) Digestive System**
Breaks down food into absorbable units that enter the blood for distribution to body cells; indigestible foodstuffs are eliminated as feces




**(j) Urinary System**
Eliminates nitrogenous wastes from the body; regulates water, electrolyte and acid-base balance of the blood.

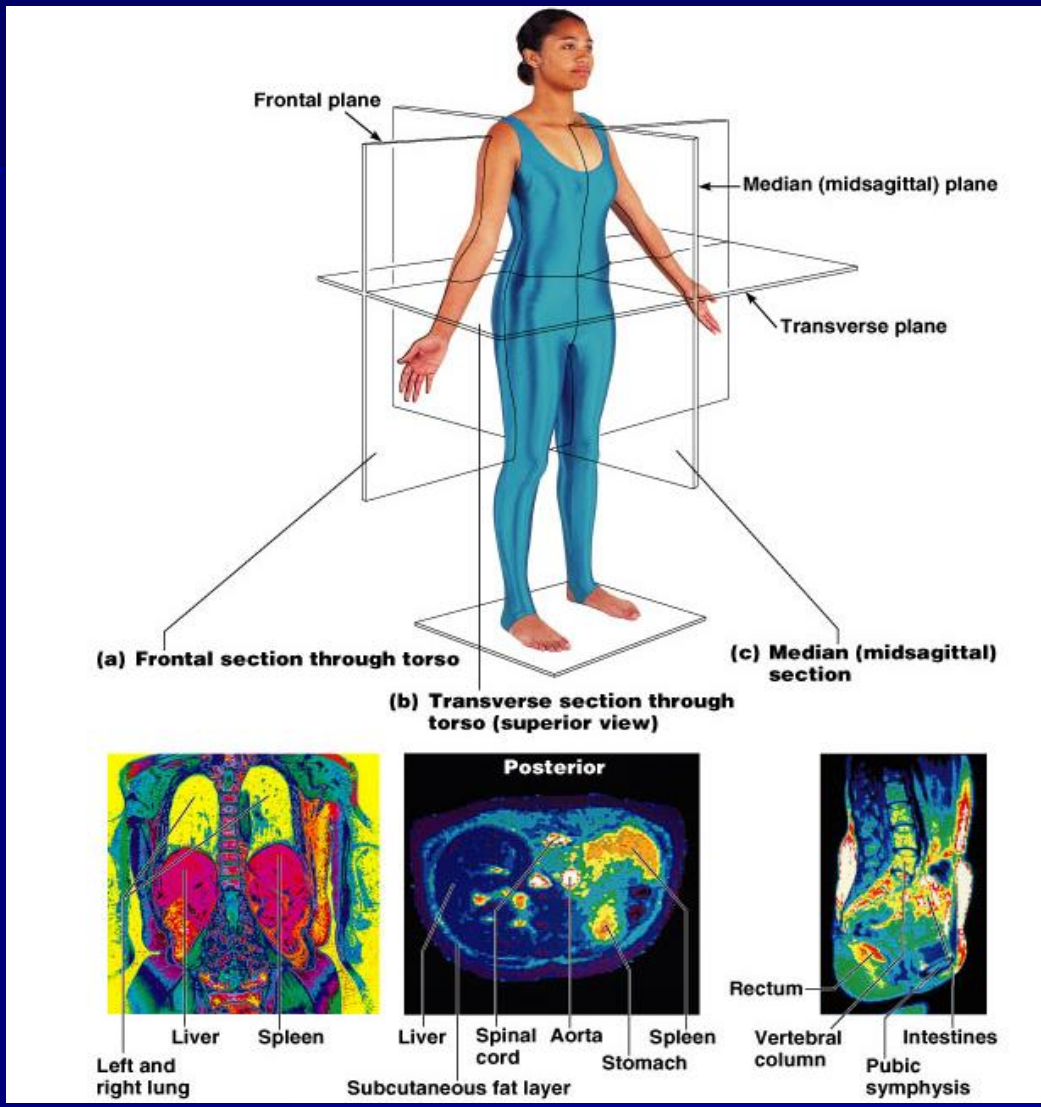



**(k) Male Reproductive System** **(l) Female Reproductive System**
Overall function is production of offspring. Testes produce sperm and male sex hormone; ducts and glands aid in delivery of sperm to the female reproductive tract. Ovaries produce eggs and female sex hormones; remaining structures serve as sites for fertilization and development of the fetus. Mammary glands of female breasts produce milk to nourish the newborn.

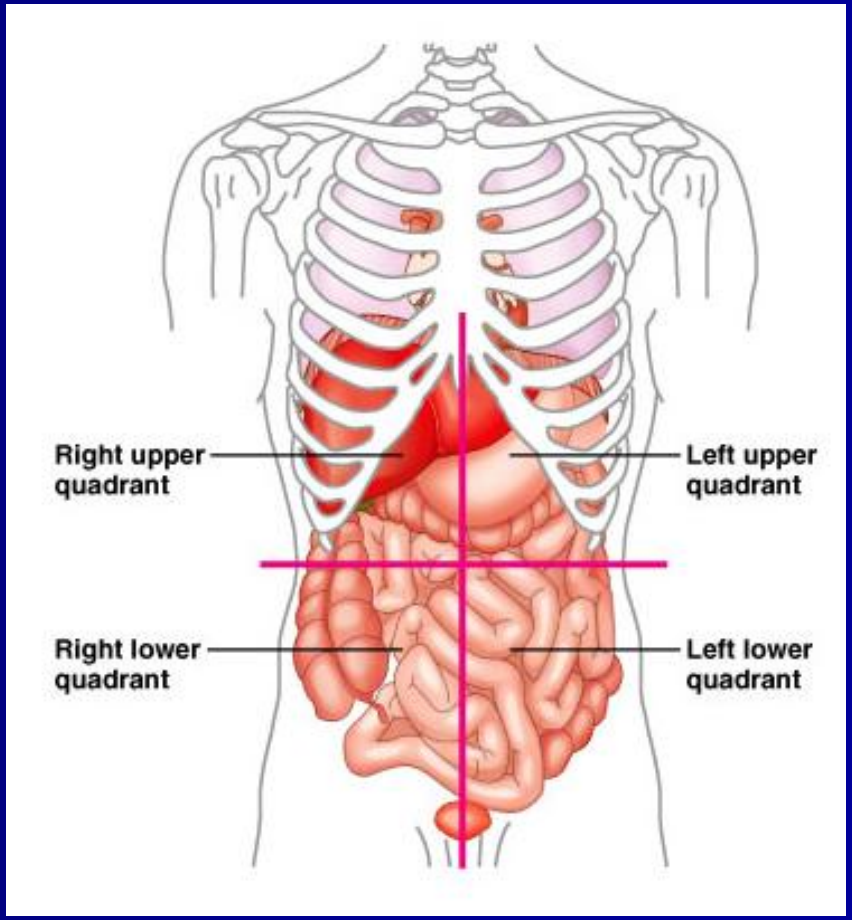
# Planes

- Frontal
  - Think front!
- Transverse
  - " Trans" = across
- Sagittal
  - Especially mid-sagittal
- Oblique
  - Any Diagonal



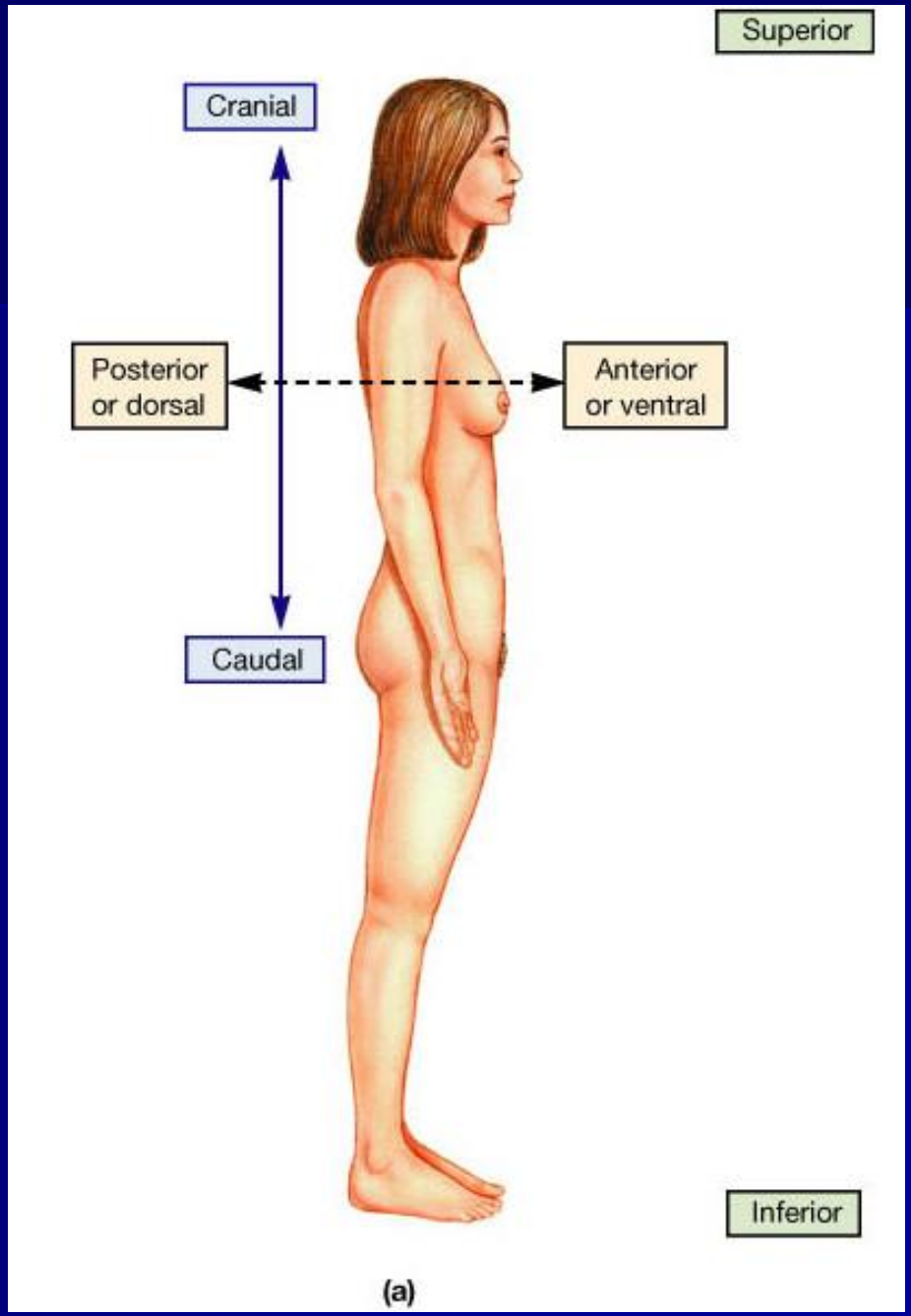
# Quadrants Surrounding the Umbilicus

- RUQ: Gall Bladder, Rt kidney
- RLQ: Appendix, Rt ovary
- LUQ: Lt liver lobe, stomach, Lt kidney
- LLQ: Small intestine, Lt ovary



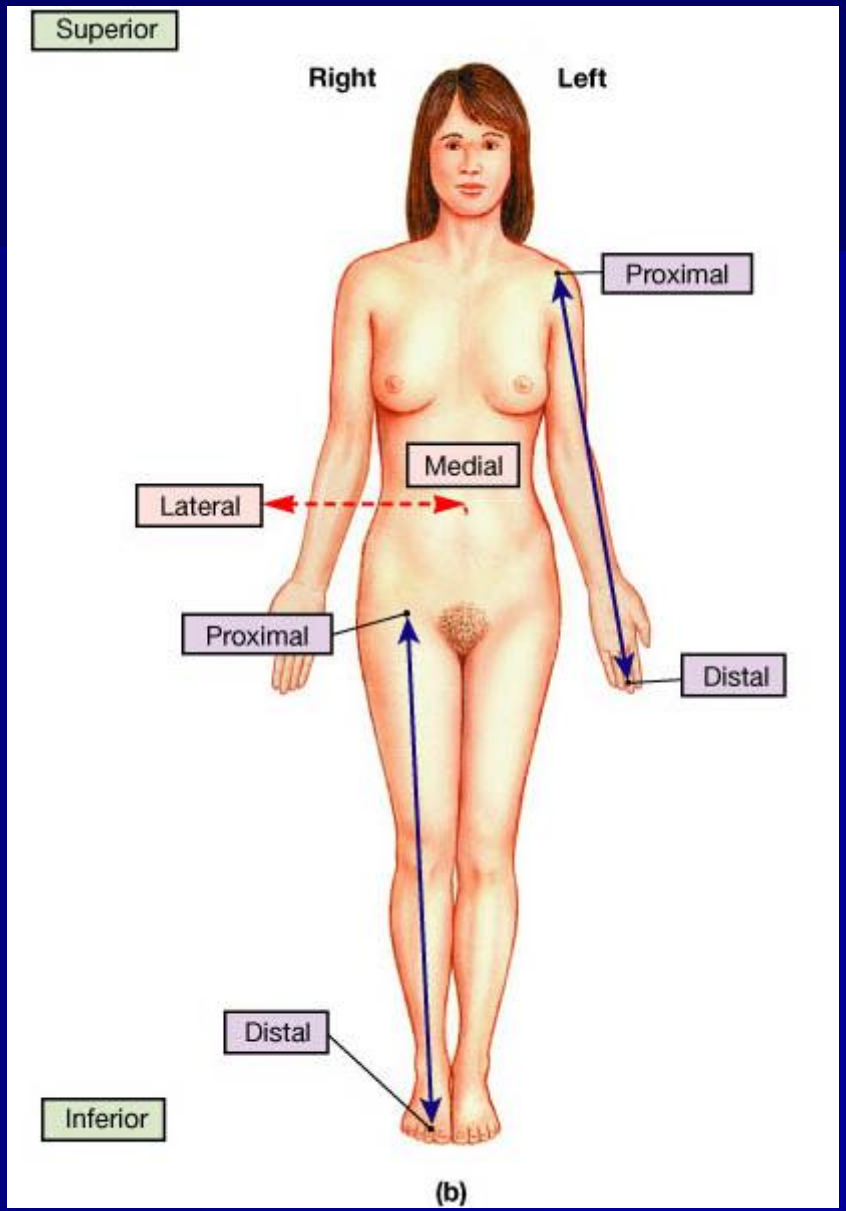
These words are used all the time, including this class!

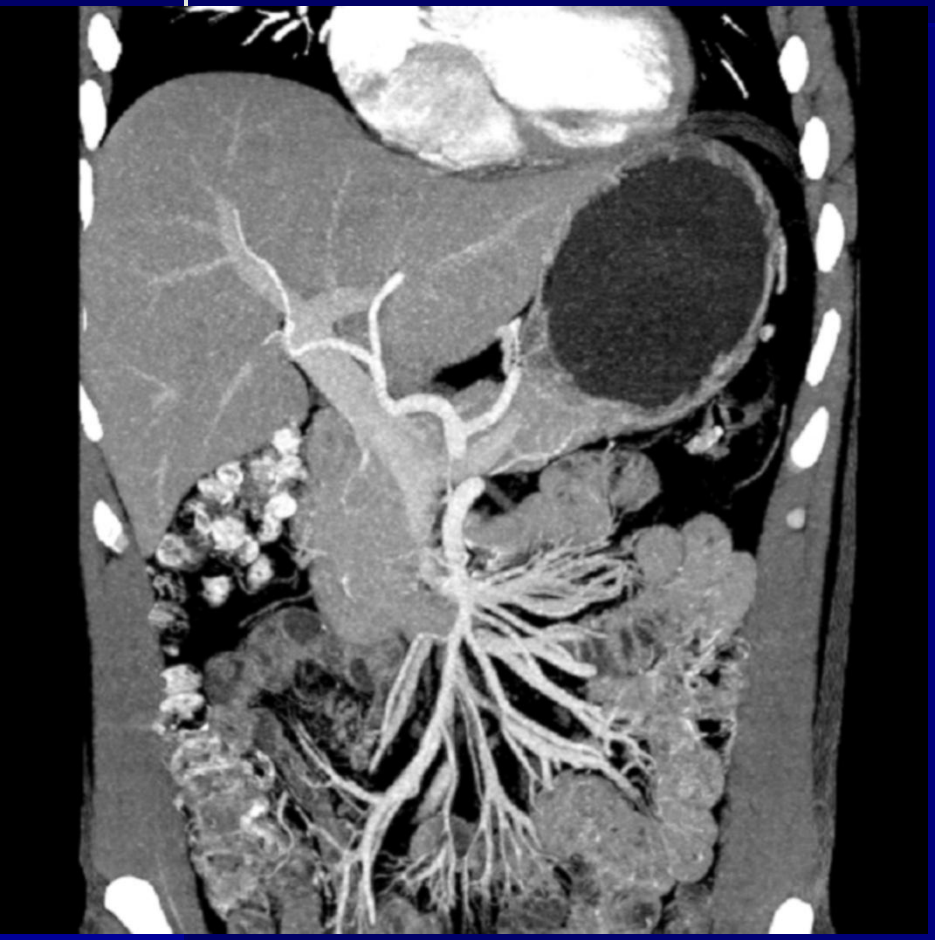
Note the Anatomic Position.

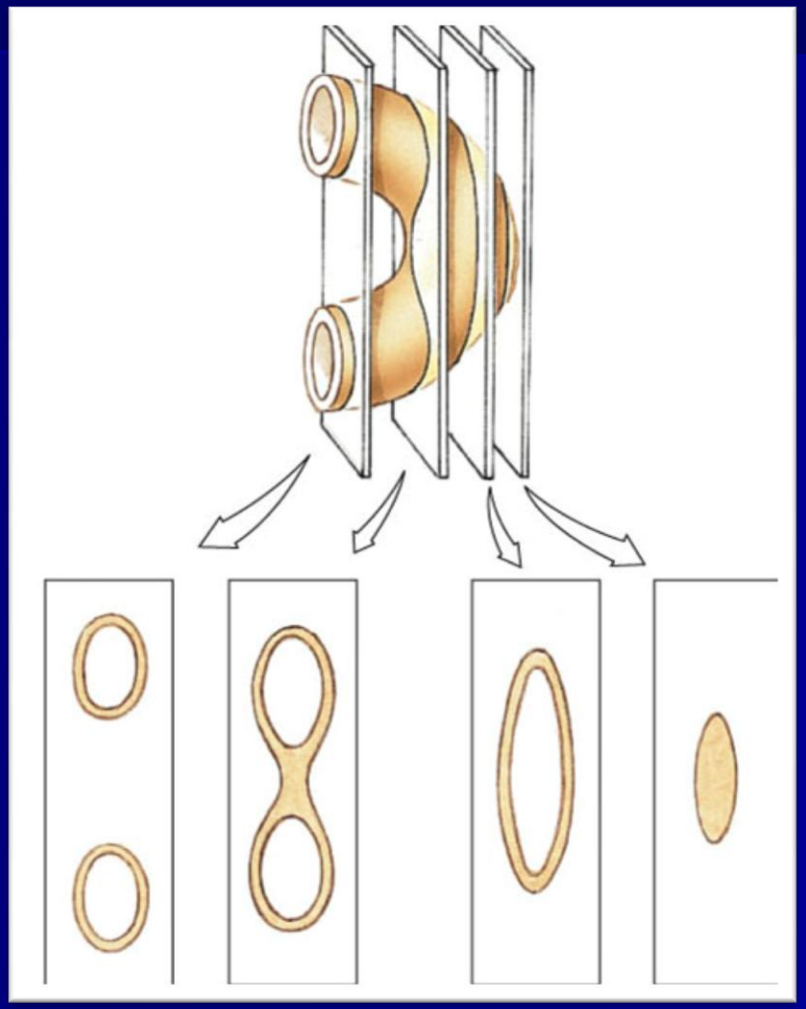


# Get used to them!

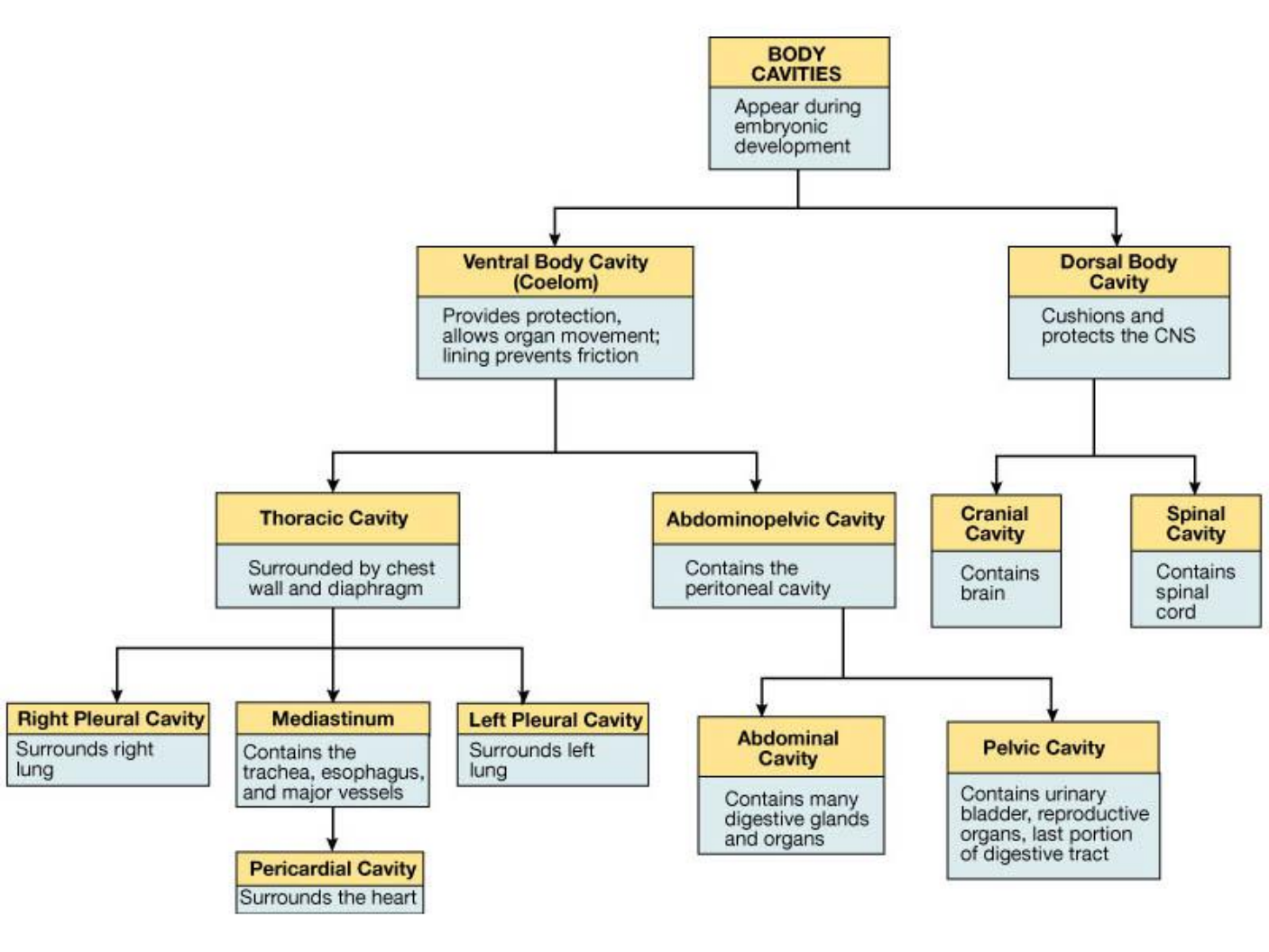
Superficial: Toward the skin
Deep: Farther inside
Medial: Toward the midline
Lateral: Away from the midline



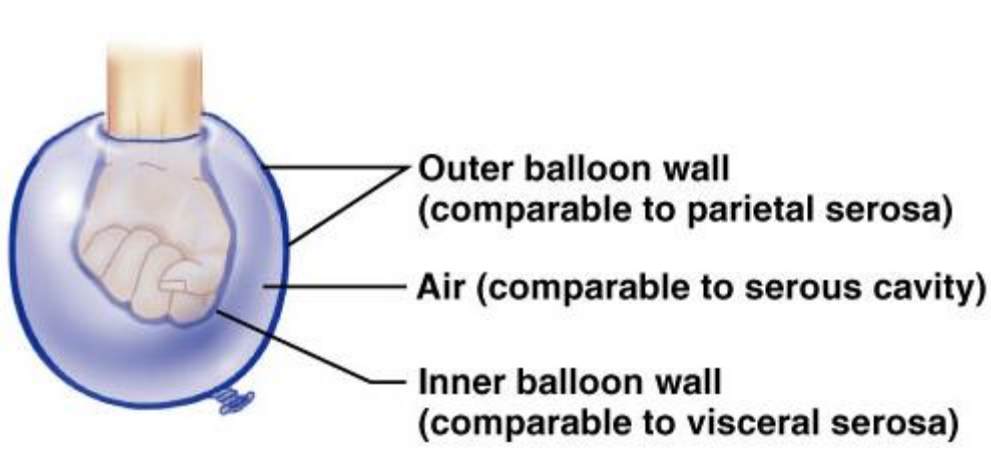




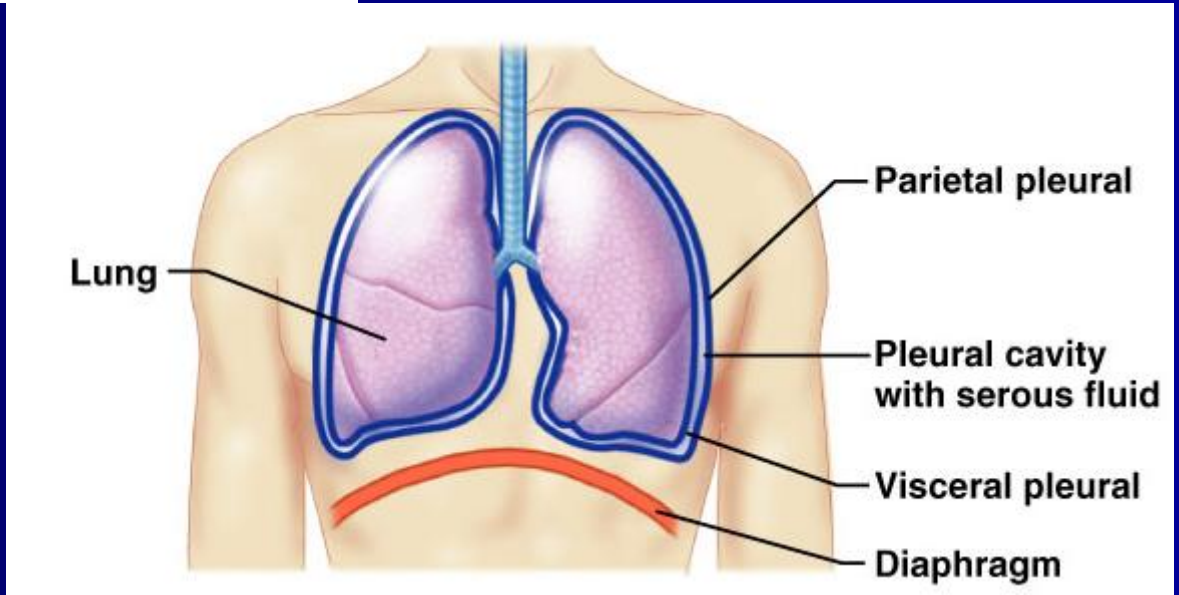
# Body Cavities



# Body Cavity Membranes




More later!



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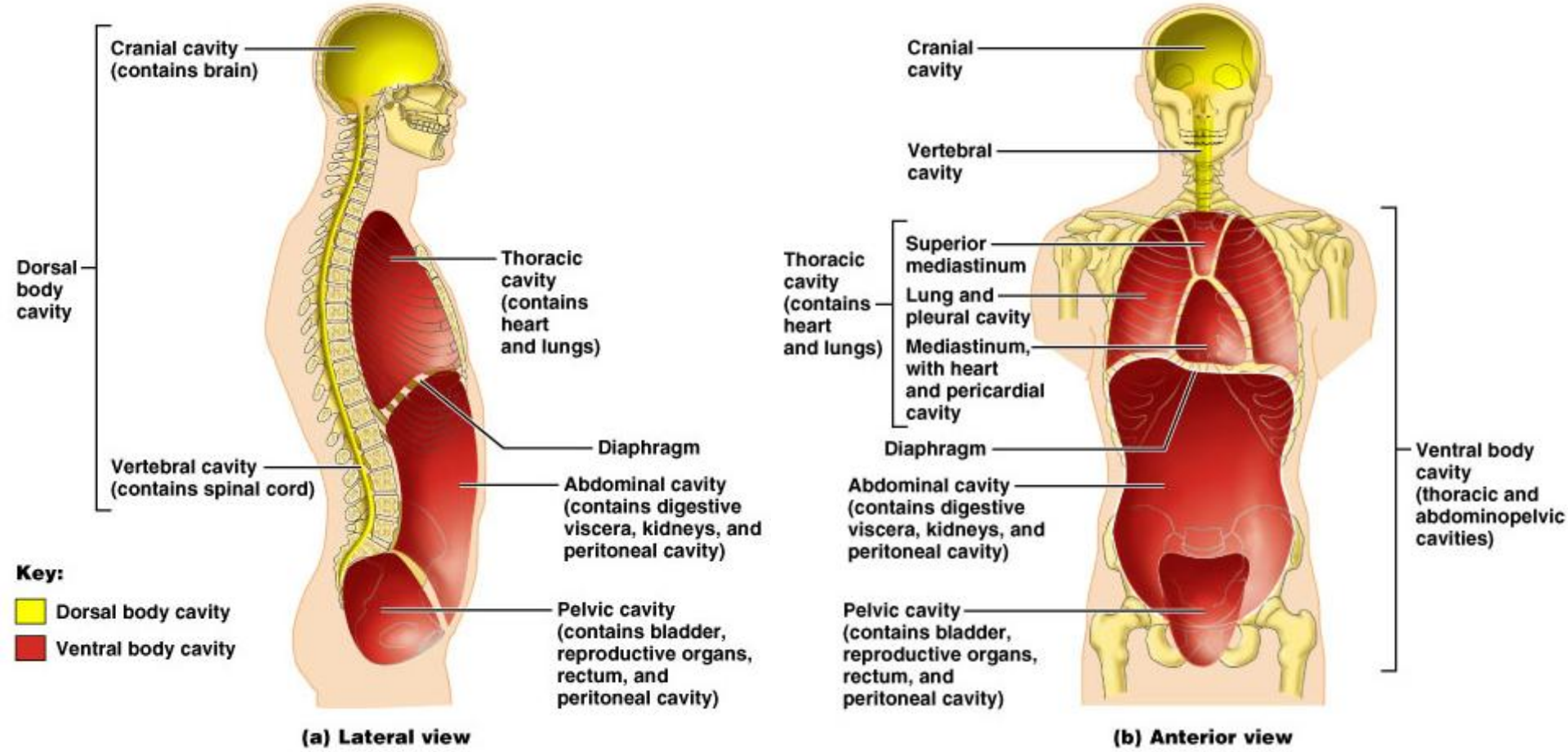

Cranial cavity (contains brain)
Dorsal body cavity
Thoracic cavity (contains heart and lungs)
Diaphragm
Vertebral cavity (contains spinal cord)
Abdominal cavity (contains digestive viscera, kidneys, and peritoneal cavity)
Pelvic cavity (contains bladder, reproductive organs, rectum, and peritoneal cavity)
Key:
Dorsal body cavity
Ventral body cavity
(a) Lateral view
Cranial cavity
Vertebral cavity
Thoracic cavity (contains heart and lungs)
Superior mediastinum
Lung and pleural cavity
Mediastinum, with heart and pericardial cavity
Diaphragm
Abdominal cavity (contains digestive viscera, kidneys, and peritoneal cavity)
Pelvic cavity (contains bladder, reproductive organs, rectum, and peritoneal cavity)
Ventral body cavity (thoracic and abdominopelvic cavities)
(b) Anterior view

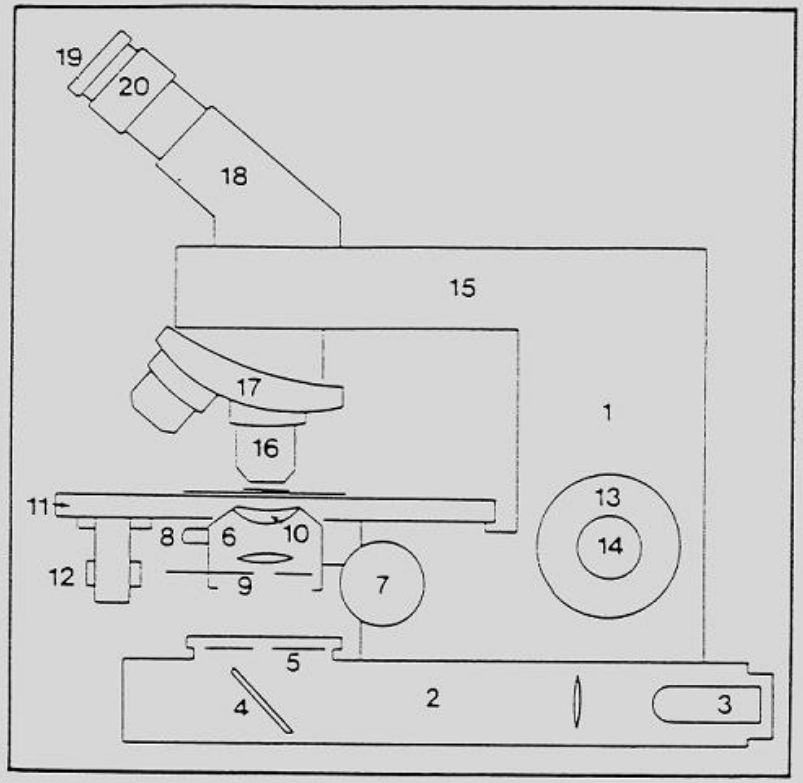
# Lab Safety (details in syllabus)

1. no open-toe or open-heel shoes allowed in the labs;
2. no eating or drinking (including WATER), nothing by mouth in the labs EVEN if it is only lecture, no fingers in mouth or eyes (contact replacement, taking medication, etc);
3. nothing down the drains, but water (and hand & dish detergents/soaps);
4. nothing into the regular trash cans but paper towels from hand-washing and clean office paper.

# Medical Imaging

- Light Microscopy (cytology)
- Electron Microscopy (ultrastructure)
  - TEM
  - SEM
- Radiography (X-Rays)
  - CT Scanning
- Ultrasound
- Positron Emission Tomography (PET)
- Magnetic Resonance Imaging (MRI)

# Light Microscopy




**Schematic Drawing of a Microscope**

*(From Peter H. Bartels, p. 8, A Manual of Cytotechnology)*

1. Stand
2. Base
3. Light Source
4. Mirror
5. Field Iris Diaphragm
6. Substage Condenser
7. Rack and Pinion
8. Centering Screws
9. Iris Diaphragm (Aperture Stop)
10. Condenser's Top Element
11. Microscope Stage
12. Control Knobs for Stage
13. Coarse Adjustment
14. Fine Adjustment Focus
15. Microscope Arm
16. Objective Lens (3.2 X, 10 X, 40 X, 100X)
17. Revolving Nosepiece
18. Binocular Tube
19. Oculars
20. Observation Tube

# Light Microscopy, cont'd

1. The specimen is fixed
    1. Usually in 10% formalin
2. Then embedded in paraffin
3. Sectioned with a microtome
    1. Approx 5 µ sections
4. and stained
    1. Enhances contrast for better visualization
    2. Many types of stains
        1. H & E = Hematoxylin and Eosin
        2. May add "artifact"

# The Light Microscope

- Always start with low power objective
- Close iris diaphragm, then open as more light is needed
- Focus on the specimen (low power first)
- Move to medium objective
  - Parfocal

http://www.udel.edu/biology/ketcham/microscope/joelle.mov

# Microscope Adjustments

- Interpupillary distance and focus of oculars
  - Binocular 'scopes only
- Condensor: usually nearly as high as it will go (Koehler illumination)
  - Iris diaphragm
- Clean slide with Kim Wipe
- Clean lenses with lens paper

# Concepts Important for Viewing

***Magnification –*** the ratio of the size of an image to the size of the object

***Resolution*** – "the ability to discriminate two close objects as separate."

***Depth of Field*** - depth that focus is clear

***Contrast Formation*** - (e.g. absorption contrast)

***Illumination Source*** - diascopic vs. episcopic

from below (compound) vs. from above (dissecting)

***Artifact –*** Distortion from preparation of the specimen

# Electron Microscopy

**Uses a beam of electrons (instead of visible light) to view topography, morphology, composition, and crystallography.**

**EM was developed for 10,000 – 25,000 X magnification. Properties of light limit magnification of light microscopes to 1000 X and resolution to 0.2 μm.**

Transmission Electron Microscope